

TITLE:

Portable cleaning appliance with rotating tool

DESCRIPTION

5 The present invention relates to rotating-tool cleaning appliances, and in particular a portable rotating-tool appliance.

10 This type of appliance is widely used especially for cleaning not very large surfaces that are difficult to get at with larger appliances.

Document US-A-6 058 542 discloses a portable electric cleaning device: the cleaning device comprises a
15 housing, an electric motor, a cleaning member, and batteries. The housing has a handgrip and a frame; the motor is installed in the frame of the housing and has a rotating shaft. The cleaning member comprises a cleaning head that can be changed depending on cleaning
20 requirements, and a connection end connectable to the rotating shaft. The batteries are inserted in the housing and drive the electric motor.

A device of this type is very handy. However, the
25 rotating tool, whether a brush, a felt pad or something else can only detach the dirt from the surface in question, not remove it: removal can be made possible only if the particles of dirt can be carried away, that is either sucked up or made heavier by the action of a
30 liquid.

Another problem has to do with the possibility of gripping the appliance efficiently depending on the type of use the user is making of it at any particular
35 time: often the handle is in the way and greatly complicates the use of appliances of this type.

The object of the present invention is therefore to provide a portable cleaning appliance with a rotating

tool capable of removing particles of dirt where used, thereby increasing its efficiency of application and increasing its versatility.

- 5 A further object of the present invention is to provide an appliance with various alternative possible ways of holding it, making its use easier and more practical.

10 The subject of the present invention is therefore a portable cleaning appliance comprising a body provided with handgrip means and with an interchangeable rotating cleaning tool, the said body containing the drive means of the said tool and the power supply means of the said drive means; there is formed in the said
15 body a pipe which at one end opens onto the said rotating cleaning tool, with which it is in fluid communication, and at the other end is connectable to means for generating a stream of fluid.

20 The present invention also relates to a portable cleaning appliance comprising a body provided with handgrip means and with an interchangeable rotating cleaning tool, the said body containing the drive means of the said tool and the power supply means of the said
25 drive means, in which the said handgrip means comprise a handle hinged to the said body, so that its angle with respect to the body can be varied to suit the conditions of use. Advantageously, the power supply means of the said appliance are located in the said
30 handle.

Other advantages and features of the present invention will be made clear in the following description of certain embodiments thereof. The description, which is
35 given by way of non-restrictive example, refers to the appended drawings, in which:

Figure 1 is a side view of the appliance according to the present invention;

Figure 2 is an enlarged detail in longitudinal section of the appliance illustrated in Figure 1;

5 Figure 3 is a schematic diagram illustrating the electric circuit and the drive means of the appliance according to the invention;

10 Figure 4 is a cross section taken on the line IV-IV of an enlarged detail from Figure 1; and

Figure 5 is an enlarged cross section of a detail relating to another embodiment of the appliance of the invention.

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Figure 1 illustrates the appliance according to the present invention, with 1 denoting the body of the appliance containing the drive means. Connected to the body 1 is a shell 2 containing the means by which the motion is transmitted to the rotating tool 3, in this case a brush with bristles 303. Formed integrally with the shell 2 is a pipe 102, on which a plug 10 is placed. Connected to the other end of the body 1 is the handle 4 which, as can be seen in the figure, can also adopt the position 4' illustrated in chain line. The appliance is operated by the user exerting pressure on the boot 206 made of elastically deformable material, such as rubber or the like, which, via the axially projecting actuator 216, acts on the button 116 of the switch (not shown in the figure).

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In Figure 2 the appliance of the invention is illustrated in longitudinal section, with the electric motor 5 housed in the body 1 of the appliance. The said motor is inserted, at its end containing the shaft 105, into a removable plate 101 which closes one end of the said body 1, having the peripheral groove 111 in which the sealing means 121 are housed. The shell 2 is fitted onto the plate 101 and it too fits tightly over another

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groove 111 containing sealing means 121 belonging to the said plate 101. The shell is attached to the said plate by the screws 412 inserted through the through holes 402 in the end wall of the said shell 2, and the screws engage in the sleeves 131 formed integrally with the plate 101. The chamber defined by the shell 2 and plate 101 houses the means by which the motion is transmitted from the pinion 115, keyed to the motor 5 shaft 105, to the gear wheel 305, coaxial with which is the spindle 315 which rotates inside the seat 222 formed in the end wall 202 of the shell 2, the threaded free end 325 of which is inserted into the connection head 502 and fastened to it by the nut 512. Around the spindle 315 in the seat 222 are the sealing means 232. The outer edge of the wall 202 of the shell 2 possesses the axial flange 302 into which the tool 3 is inserted. The said tool 3 is coupled to the rotating connection head 502 by insertion of the fingers 103, which are of essentially conical form and end in toothlike projections 113, capable of being inserted into the radial cavities 522 of the connection head 502, to which they gain access via the axial passages 532.

Formed on one side of the shell 2, and integrally with it, is the pipe 102, which at one end opens onto the end wall 202 of the shell 2, in fluid communication with the tool 3, and at the other end has a mouth 112 for connecting it to means for generating a fluid flow, such as a vacuum cleaner or an appliance capable of producing steam, or indeed an appliance capable of producing a jet of cleaning liquid. At the mouth 112 is a plug 10 which closes off the pipe 102 if the appliance is being used on its own.

Figure 3 shows schematically the power supply circuit for the drive means of the appliance. The batteries 6 are connected to the motor 5 by the contacts 405. The switch 106 is inserted into one leg of the circuit and is operated by the button 116. Also visible in the

figure is the gear train, which runs from the cup gear 215 to the gear wheel 305 through the gears 205, which connects the pinion 115 keyed to the shaft 105 of the motor 5 to the spindle 315 which, as shown in Figure 2, is connected to the tool 3 by the connection head 502.

Figure 4 illustrates a detail relative to the connection between the handle 4 and the body 1 of the appliance of the invention. As shown in the figure, the opposite end of the body 1 from that connected to the shell 2 has a spigot 301 whose side walls are held in between the two arms 114 and 124 of the fork 104 at the end of the handle 4. The two arms and the spigot are connected together by the threaded pins 214, 314 and the threaded bushes 425 projecting axially from the cavities 311 in the two side walls of the spigot 301. The bushes 425 are made from the plates 415 which are connected to the contacts 405, which in turn are connected to the motor 5. The cylindrical contact elements 506 are forced into the cavities 311 and their lower portion is in contact with the bushes 425 through the action of the tubes 234, 334, which are coaxial with the pins 214, 314 and are made in one piece with the plugs 204, 304 to which the said pins are firmly connected. The ends of the cylindrical contact elements 506 that point towards the respective plugs 204, 304 are themselves in contact with the bushes 316, 416 formed in the respective contact strips 306 and 406 and housed in the inner walls of the sleeves 144, 134, the latter projecting axially from the respective arms 114 and 124 of the fork 104 towards the plugs 204 and 304. Between the forks 114, 124 and the spigot 301 are the seals 321, which protect the electrical connections against the risk of contact with moisture, as do the seals 224 and 324 around the edges of the plugs 204 and 304. The plugs 204 and 304 are provided with the projections 244 and 344, respectively, projecting axially outwards from these; these projections allow the user to loosen or tighten the plugs, that is to say

the threaded pins in the bushes, to vary the angle of the handle.

Figure 5 illustrates a second embodiment of the
5 appliance of the invention. Identical parts are given the same numbers. The body 1 is provided in this case with a side spigot 401, which has, on the side facing the outer side wall of the body 1, a cylindrical cavity 411 with a central axial hole 451 running through into
10 the tube 461 formed as one piece with the spigot 401 itself. The cavity 411 houses the plug 501 which is connected to the threaded end 611 of the pin 601 by means of the bush 511 forced into the axial cavity 541, in which it is locked by means of the toothlike
15 projections 521 projecting from its lateral surface. Inserted between the plug 501 and the cavity 411 of the spigot 401 is a compressed spring 531; the pin is locked so that it cannot slide axially out of its seat by the elastic ring 631 engaged in the annular groove
20 621 formed around the pin 601 itself.

The other end of the pin is connected to the side spigot 404 projecting from the handle 4 by insertion of its ruled end portion 671 into the axial bush 414
25 formed in the said spigot 404. This end is also given a threaded axial hollow 641 which connects to the screw 544 inserted into the tube 534 of the plug 504, with an annular groove 514 containing the sealing means 524. The pin also has another annular groove 651 housing
30 sealing means 661. Between the spigot 401 and the spigot 404, sealing and sliding means 431 are inserted.

The spigot 401 is provided, on its wall facing the spigot 404, with an aperture 441 through which the
35 conductors 515 connected at one end to the contacts 505 of the electric motor 5 can access the spigot 404, which has a corresponding aperture 434. At the other end, the conductors 515 are connected to the contact strips 706, 806 which run through the spigot's aperture

444 - containing sealing means 454 - and are connected to the poles of the battery 6. On the adjoining faces of the two spigots, there are, besides the apertures 441 and 434, the toothlike projections 464 projecting from the wall of the spigot 404 and engaging with the cavities 471 formed in the wall of the spigot 401.

The operation of the appliance according to the present invention will be obvious from the following account.

10 When preparing to use the appliance, the user selects the appropriate rotating cleaner, in this case the brush 3 with bristles 303, and fits it onto the connection head 502, inserting the ends 113 of the fingers 103 into the cavities 522 of the connection head 502, through the axial passages 532. When the handle 4 has been set in the most convenient position, pressure on the boot 206 of the switch 106 will start the motor 5 and set the brush 3 rotating.

20 If it is wished to combine the action of the appliance of the invention with a source of fluid flow, as for example a vacuum cleaner, a water tap or an appliance capable of generating steam, a hose connected to such a flow generator will be connected to the pipe 102 formed on one side of the shell 2 and communicating with the tool 3, by inserting the end of the hose of the said fluid-flow generator on the mouth 112 of the pipe 102. In this way the dirt, which the tool proper can only remove, will be sucked away through the tool 3; similarly, by releasing steam the rotating tool will be able to attack and remove much more stubborn traces of dirt.

Naturally, the pipe 102 can also be used simply to connect the appliance to a pole to allow the appliance to be used on surfaces that are difficult to get out directly, such as ceilings or the like.

The handle 4 can be adjusted through a wide arc with respect to the body 1 of the appliance, even being able to adopt the configuration illustrated in chain line marked 4'. Its positioning is however very stable: in practice, in order adjust the handle 4, the user must loosen the pins 214, 314 in the bushes 425 by using the respective projections 244 and 344 of the plugs 204, 304. Once the best position has been selected, the connection between the pins and the threaded bushes keeps the position of the handle 4 stable. The efficiency of the electrical connection between the battery 6 and the motor 5 is ensured by the contacts 316, 416 of the forks 114, 124 engaging with the cylindrical contact elements 506, which in turn are connected to the bushes 425 formed from the strips 405.

The alternative embodiment illustrated in Figure 5 has the handle 4 and the body 1 connected in quite a different way, to allow the conductors to pass through the connection (formed by the two spigots 401 and 404 pivoting about the same pin 601), without the need for sliding contacts, giving an undoubted structural and functional simplification. Formed on the adjoining walls of the two spigots are, on the one hand, the apertures 441 and 434 for the conductors 515 to pass through, and on the other the toothlike projections 464 engaging in the cavities 471 stabilize the connection as far as the angle which the user desires to give the handle 4 with respect to the body 1 of the appliance is concerned. The elastic ring 631 placed around the pin 601 advantageously prevents any possibility of accidental separation of the body from the handle, even if the user completely removes the plug 501.

In both embodiments illustrated, the appliance of the invention is illustrated with sealing means preventing liquids getting into the interior of the shell 2, body 1 and handle 4, or entering the connection between these last two parts. This type of embodiment allows

the appliance to be used with a high degree of safety, improving its efficiency during cleaning, which can be carried out safely in the presence of water and cleaning liquids.

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The appliance constructed in this way can therefore be used in a wide range of household cleaning situations, either alone or in combination with means for generating a stream of fluid. In this type of configuration the resulting synergy is considerable, as the combined action of the appliance of the invention with such means offers results which hitherto were obtainable only with very much more complicated machines that are naturally much more expensive.

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From another point of view, the ability to adjust the angle of the handle of the appliance while still having the motor power supply battery inside the handle, offers a high degree of practicality of use without affecting the balance of the appliance.

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